Eugenol mitigated acute lung but not spermatic toxicity of C60 fullerene emulsion in mice

Felipe Gomes Pinheiro; Maria Diana Moreira-Gomes; Mariana Nascimento Machado; Tailane dos Santos Almeida; Priscila da Penha Apolinario Barboza; Luis Felipe Silva OliveiraM; Francisco Sales Avila Cavalcante; Jose Henrique Leal-Cardoso; Rodrigo Soares Fortunato; Walter Araujo Zin

Abstract

C60 fullerene (C60) is a nano-pollutant that can damage the respiratory system. Eugenol exhibits significant anti-inflammatory and antioxidant properties. We aimed to investigate the time course of C60 emulsion-induced pulmonary and spermatic harms, as well as the effect of eugenol on C60 emulsion toxicity. The first group of mice (protocol 1) received intratracheally C60 emulsion (1.0 mg/kg BW) or vehicle and were tested at 12, 24, 72 and 96 h (F groups) thereafter. The second group of mice (protocol 2) received intratracheally C60 emulsion or vehicle, 1 h later were gavaged with eugenol (150 mg/kg) or vehicle, and experiments were done 24 h after instillation. Lung mechanics, morphology, redox markers, cytokines and epididymal spermatozoa were analyzed. Protocol 1: Tissue damping (G) and elastance (H) were significantly higher in F24 than in others groups, except for H in F72. Morphological and inflammatory parameters were worst at 24 h and subsequently declined until 96 h, whereas redox and spermatic parameters worsened over the whole period. Eugenol eliminated the increase in G, H, cellularity, and cytokines, attenuated oxidative stress induced by C60 exposure, but had no effect on sperm. Hence, exposure to C60 emulsion deteriorated lung morphofunctional, redox and inflammatory characteristics and increased the risk of infertility. Furthermore, eugenol avoided those changes, but did not prevent sperm damage.

Keywords: Lung mechanics; Inflammation; Oxidative stress; Sperm vitality; C60 toxicity